

To prevent accidents arising from the use of this controller, please ensure the operator using it receives this manual.



Caution

- This instrument should be used according to the specifications described in the manual. If it is used outside the specifications, it may malfunction or cause fire.
- Be sure to follow the warnings, cautions and notices. If not, it could cause serious injury or malfunction.
- Do not apply a commercial power source to the sensor connected to the input terminal nor allow the power source to come into contact with the sensor.
- Specifications of the FCS-13A and the contents of this instruction manual are subject to change without notice.
- Care has been taken to assure that the contents of this instruction manual are correct, but if there are any doubts, mistakes or questions, please inform our sales department.
- Be sure to turn the power supplied to the instrument OFF when cleaning.
- Wipe the instrument using dry soft cloth.
(If the paint thinner is used for wiping, the instrument may be deformed or discolored.)
- The display parts are more easily damaged. Do not strike them with hard objects or press hard on them.
- Any unauthorized transfer or copying of this document, in part or in whole, is prohibited.
- Shinko Technos is not responsible for any damages or secondary damages incurred as a result of using this product, including any indirect damages.

1. Model names

1.1 Model names

FCS-13A □ / □, □ □ □		Series name: FCS-13A (W48 x H48 x D100mm)	
Control action	3	PID *1	
Alarm 1 (A1)	A	Alarm action *2	
Control output (OUT)	R	Relay contact: 1a	
	S	Non-contact voltage (for SSR drive): 12 ⁺² ₀ Vdc	
	A	Current: 4 to 20mA _{dc}	
Input	M	Multi-range *3	
Option	A2	Alarm 2 (A2)	
	W(20A)	Heater burnout alarm	Rated current: 20A
	W(50A)		Rated current: 50A
	BK	Color, Black	
	BL	Screw type mounting bracket	
	IP	Dust-proof•Drip-proof (IP54)	
TC	Terminal cover		

*1: Fuzzy self-tuning PID, PID, PD and ON/OFF action can be selected by internal switch.

*2: 13 types of temperature alarm action (including No alarm action) can be selected by internal switch.

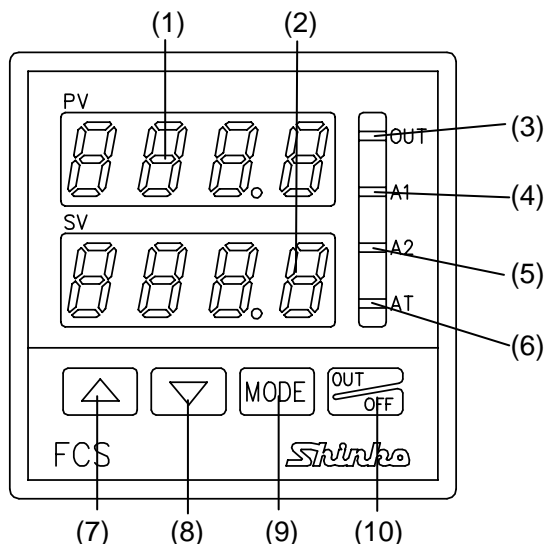
*3: 5 input types of thermocouple and 2 input types of RTD can be selected by internal switch.



1.2 How to indicate the model nameplate

Model nameplates are put on the case and on the inner assembly.

	[Model nameplate]	[Example]	
(1)	FCS-13A-R/M	→ Relay contact output/Multi-range input	(1): Model name
(2)	A2	→ Alarm 2 (A2) output	(2): Option codes
	W(20A)	→ Heater burnout alarm output (20A)	(3): Instrument number (Indicated only on the inner assembly.)
(3)	No.		

2. Name and functions of the section

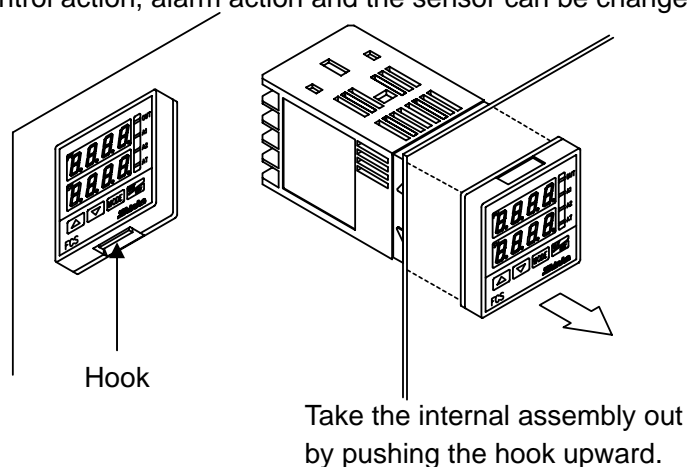


- (1) PV display : The red LED lights up while process variable is being indicated.
- (2) SV display : The green LED lights up while the setting value or manipulated variable is being indicated.
- (3) Control output (OUT) indicator:
The green LED lights up when the control output is on.
(For current output type, this blinks corresponding to the output every 0.125 seconds.)
- (4) Alarm 1 (A1) output action indicator:
The red LED lights up when Alarm 1 (A1) output is on.
- (5) Alarm 2 (A2) output [Option] or Heater burnout alarm action indicator [Option]:
The red LED lights up when Alarm 2 (A2), Heater burnout alarm or Sensor burnout alarm output is on.
- (6) Auto-tuning action indicator:
The yellow LED blinks while the Auto-tuning is being performed.
- (7) Increase key : Increases the setting value or selects the setting value.
- (8) Decrease key : Decreases the setting value or selects the setting value.
- (9) Mode key : Switches the setting mode or registers the setting value by pressing this key.
- (10) OUT/OFF key: Turns the control output on or off.
The control output OFF function can be selected from any mode by pressing the  key for approx. 1 second.
Once the control output OFF function is enabled, the function cannot be released even if the power to the instrument is turned off and on again.
To release the function, press the  key again for approx. 1 second.

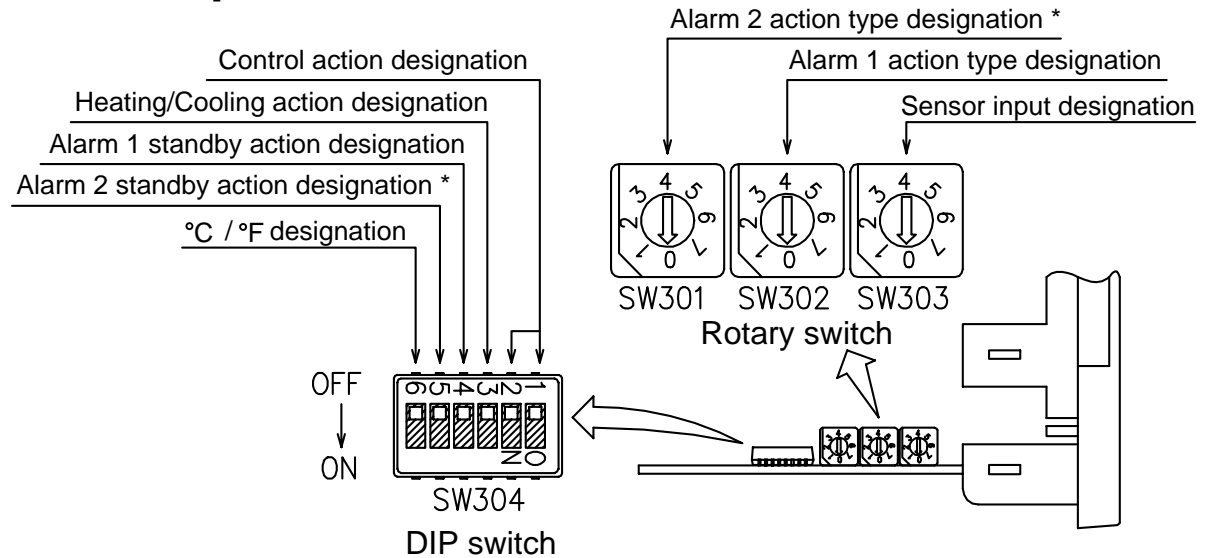
3. Setup

The specifications of FCS-13A such as the control action, alarm action and the sensor can be changed. Turn the power supply to the instrument off before setup.

Take the internal assembly out from the case by pushing the hook (bottom of the instrument) upward in the direction indicated by the arrow and holding the notches.



[Internal switches]



* Rotary switch A2 (SW301) will be equipped only when the option [A2] is applied.

[Fig. 3-2]

Switch setting

The following items can be designated by the DIP switch (SW304). See [Table 3-1] below.
 Factory adjusted as all switches OFF

[Table 3-1]









Item	Switch No. (SW304)	Designation	Switch status	
Control action	1, 2	Fuzzy self tuning PID	No.1: OFF	No.2: OFF
		PID action	No.1: ON	No.2: OFF
		PD action	No.1: OFF	No.2: ON
		ON/OFF action	No.1: ON	No.2: ON
Heating (reverse)/ Cooling (direct) action	3	Reverse (heating) action	OFF side	
		Direct (cooling) action	ON side	
Alarm 1 (A1) standby action	4	Without standby action	OFF side	
		With standby action	ON side	
Alarm 2 (A2) standby action *1	5	Without standby action	OFF side	
		With standby action	ON side	
°C / °F	6	°C	OFF side	
		°F	ON side	

*1: Alarm 2 (A2) standby function will be activated only when the option [A2] is applied.

Sensor selection

The sensor type can be selected by rotary switch (SW303).
 °C or °F can be selected by rotary switch (SW304, No.6).
 Factory adjusted as [K, -200 to 1370°C]

[Table 3-2]

SW303 No.	Sensor type	Scale range	
		SW304 (No.6 OFF)	SW304 (No.6 ON)
 0	K	-200 to 1370°C	-320 to 2500°F
 1	J	-200 to 1000°C	-320 to 1800°F
 2	R	0 to 1760°C	0 to 3200°F
 3	B	0 to 1820°C	0 to 3300°F
 4	PL-II	0 to 1390°C	0 to 2500°F
 5	N	0 to 1300°C	0 to 2300°F
 6	Pt100	-199.9 to 850.0°C	-199.9 to 999.9°F
 7	JPt100	-199.9 to 500.0°C	-199.9 to 900.0°F

Alarm 1 (A1) and Alarm 2 (A2) action selection

















The alarm action type can be designated by the rotary switch A1 (SW302) and A2 (SW301). The rotary switch A2 (SW301) is equipped only when the option A2 is applied.

Rotary switch A1 (SW302): Alarm 1 (A1) action

Rotary switch A2 (SW301): Alarm 2 (A2) action

Factory adjusted as No alarm action for Switch A1 (SW302) and Switch A2 (SW301)

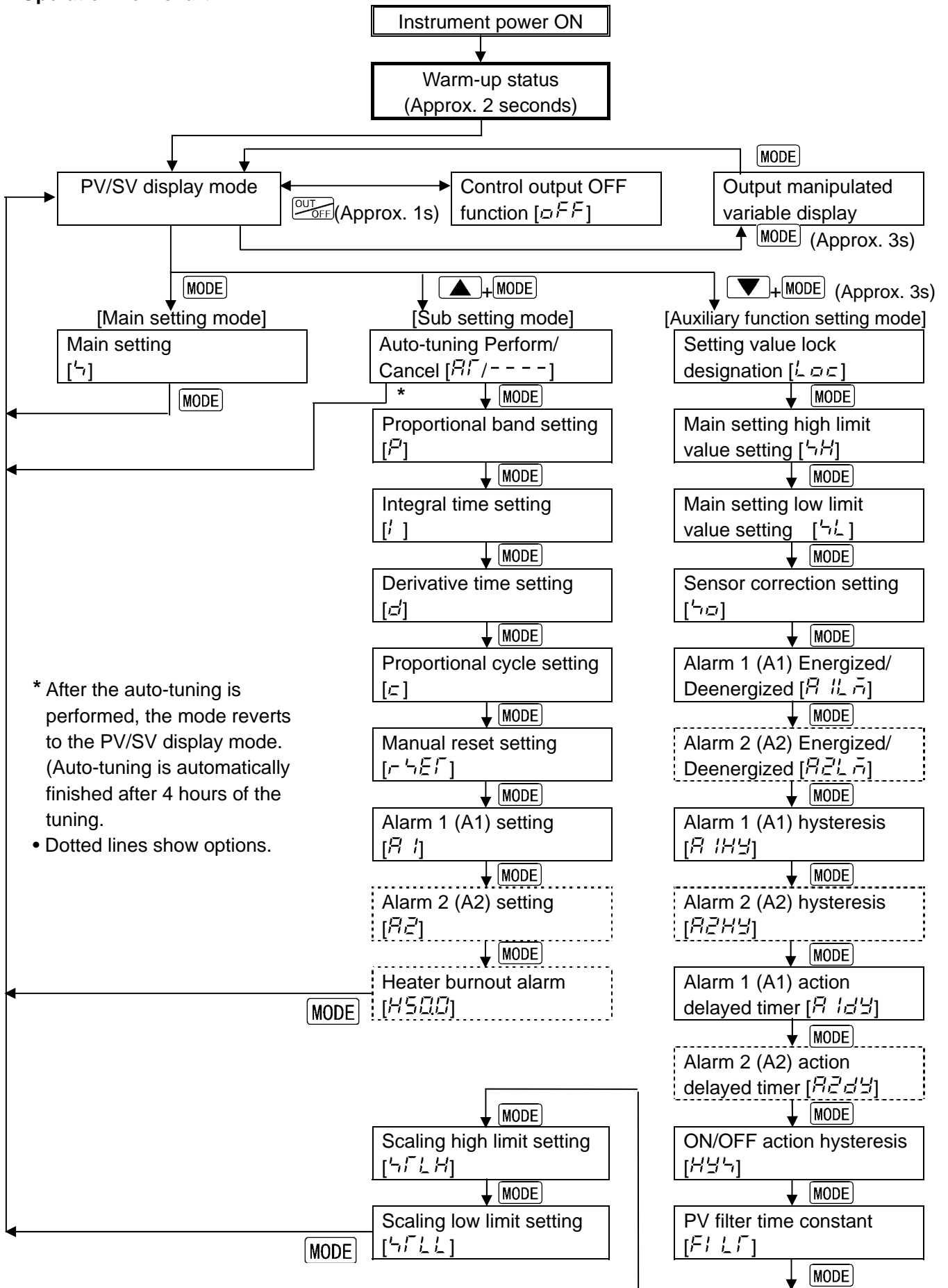
[Table 3-3]

Alarm 1 (A1) action	A1(SW302) Switch No.	Alarm 2 (A2) action	A2(SW301) Switch No.
No alarm action	 0	No alarm action	 0
High limit alarm	 1	High limit alarm	 1
Low limit alarm	 2	Low limit alarm	 2
High/Low limits alarm	 3	High/Low limits alarm	 3
High/Low limit range alarm	 4	High/Low limit range alarm	 4
Process high alarm	 5	Process high alarm	 5
Process low alarm	 6	Process low alarm	 6
No alarm action	 7	No alarm action	 7

After the setup, insert the inner assembly into the case. Ensure not to confuse the top and bottom of the inner assembly.

4. Operation

4.1 Operation flow chart




4.2 PV/SV display mode

The PV display indicates the characters of the sensor type and temperature unit and the SV display indicates the rated scale maximum value for approx. 2 seconds after the power is turned on. See [Table 4.2-1]. (If any other value is set at the main setting high limit value setting, the SV display indicates the value.)

During this time, all outputs and the LED indicators are in their off status.

After that, actual temperature is indicated on the PV display or the main setting value on the SV display, and the control starts.

(While the control output OFF function is working, $\square FF$ will be indicated on the PV display.

To release the function, press the  key for approx. 1 second.)

[Table 4.2-1]

Input	°C		°F	
	PV display	SV display	PV display	SV display
K	<i>k C</i>	<i>1310</i>	<i>k F</i>	<i>2500</i>
J	<i>j C</i>	<i>1000</i>	<i>j F</i>	<i>1800</i>
R	<i>r C</i>	<i>1760</i>	<i>r F</i>	<i>3200</i>
B	<i>b C</i>	<i>1820</i>	<i>b F</i>	<i>3300</i>
PL-II	<i>PL2C</i>	<i>1390</i>	<i>PL2F</i>	<i>2500</i>
N	<i>n C</i>	<i>1300</i>	<i>n F</i>	<i>2300</i>
Pt100	<i>Pt C</i>	<i>8500</i>	<i>Pt F</i>	<i>9999</i>
JPt100	<i>JPt C</i>	<i>5000</i>	<i>JPt F</i>	<i>9000</i>

4.3 Main setting mode

Character	Name, Description, Setting range
\hookrightarrow	Main setting <ul style="list-style-type: none"> • Sets main setting value for the main control. • Main setting low limit value to main setting high limit value • Factory adjusted as 0°C (°F)

4.4 Sub setting mode

Character	Name, Description, Setting range
<i>PF</i>	Auto-tuning Perform/Cancel <ul style="list-style-type: none"> • Designates auto-tuning Perform or Cancel. • Not available for the PD action or ON/OFF action • If the auto-tuning is cancelled in the process, P, I and D values return to the former value as when the auto-tuning is performed. • Auto-tuning will be canceled automatically after 4 hours of the tuning. • Factory adjusted as [- - -]
<i>P</i>	Proportional band value setting <ul style="list-style-type: none"> • Sets the proportional band for the control output. • Not available when the control action is ON/OFF action. • Setting range: 0.1 to 999.9% • Factory adjusted as 2.5%
<i>I</i>	Integral time setting <ul style="list-style-type: none"> • Sets the integral time for the control output. • Setting the value to 0 disables the function. • Not available for the PD action or ON/OFF action. • Setting range: 0 to 3600 seconds • Factory adjusted as 200 seconds
<i>D</i>	Derivative time setting <ul style="list-style-type: none"> • Sets the derivative time for the control output. • Setting the value to 0 disables the function. • Not available when the control action is ON/OFF action. • Setting range: 0 to 3600 seconds • Factory adjusted as 50 seconds
<i>C</i>	Proportional cycle setting <ul style="list-style-type: none"> • Sets the proportional cycle value. • Not available for ON/OFF action or when the current output type is selected. • For the relay contact output type, if the proportional cycle time is decreased, the frequency of the relay action increases, and the life of relay contact is shortened. • Setting range: 1 to 120 seconds • Factory adjusted as 30 seconds for R/M, 3 seconds for S/M type

<i>r4EF</i>	<p>Manual reset setting</p> <ul style="list-style-type: none"> • Sets the reset value to correct the offset (the difference between the PV and SV in equilibrium state.) • Available for the PD action • Setting range: \pmproportional band converted value However, -199.9 to 999.90°C (°F) • Factory adjusted as 0.0°C <p>How to set manual reset</p> <p>When SV>PV: Set the positive (+) value (SV-PV) When SV<PV: Set the negative (-) value (SV-PV)</p>
<i>R1</i>	<p>Alarm 1 (A1) setting</p> <ul style="list-style-type: none"> • Sets the action point for Alarm 1 (A1). • Not available when the rotary switch No. 0 is selected in Alarm 1 (A1) action selection. • As to the setting range, refer to [Table 4.4-1]. • Factory adjusted as 0°C
<i>R2</i>	<p>Alarm 2 (A2) setting</p> <ul style="list-style-type: none"> • Sets the action point for Alarm 2 (A2). • Not available when the rotary switch No. 0 is selected in Alarm 2 (A2) action selection or when the option [A2] is not applied. • The setting range and initial value are the same as those of Alarm 1 (A1) setting.
<i>H500</i>	<p>Heater burnout alarm setting</p> <ul style="list-style-type: none"> • Sets the heater current value for the Heater burnout alarm. • This setting item is available only when the option [W] is applied. • Self-holding is not available for the alarm output. • Setting range: In the case of 20A, 0.0 to 20.0A In the case of 50A, 0.0 to 50.0A • Factory adjusted as 0.0A

[Table 4.4-1]

Alarm action type	Setting range	Setting range (with decimal point)
High limit alarm	-200 to 200°C (°F)	-199.9 to 200.0°C (°F)
Low limit alarm	-200 to 200°C (°F)	-199.9 to 200.0°C (°F)
High/Low limits alarm	(0 to 200) °C (°F)	(0.0 to 200.0) °C (°F)
High/Low limit range alarm	(0 to 200) °C (°F)	(0.0 to 200.0) °C (°F)
Process high alarm	Input range minimum to input range maximum	Input range minimum to input range maximum
Process low alarm	Input range minimum to input range maximum	Input range minimum to input range maximum

The setting range of the standby function is the same as that of the alarm action.

The alarm action point is set by \pm deviation to the main setting except process value alarm.

4.5 Auxiliary function setting mode

Character	Name, Description, Setting range
<i>L0C</i>	<p>Setting value lock designation</p> <ul style="list-style-type: none"> • Locks the setting value to prevent errors. The setting item to be locked depends on the designation. • PID auto-tuning or auto-reset will not function if Lock 1 or Lock 2 is designated. • - - - - (Unlock): All setting values can be changed. • <i>L0C1</i> (Lock 1): None of the setting values can be changed. • <i>L0C2</i> (Lock 2): Only main setting value is changeable. • <i>L0C3</i> (Lock 3): All setting values can be changed, however, they revert to their former values after the power is turned off because they are not stored in the non-volatile memory.
<i>LH</i>	<p>Main setting high limit value setting</p> <ul style="list-style-type: none"> • Sets the high limit value of the main setting. • Main setting low limit value to input range maximum value • Factory adjusted as 400°C

<i>L_L</i>	Main setting low limit value setting <ul style="list-style-type: none"> • Sets the low limit value of the main setting. • Input range minimum value to main setting high limit value • Factory adjusted as 0°C
<i>L_D</i>	Sensor correction setting <ul style="list-style-type: none"> • Sets sensor correction value. • Setting range: -100.0 to 100.0°C (°F) • Factory adjusted as 0.0°C
<i>R1L_A</i>	Alarm 1 (A1) action Energized/Deenergized selection <ul style="list-style-type: none"> • Sets the Alarm 1 (A1) action as Energized or Deenergized. • Not available when rotary switch No.0 is selected in Alarm 1 (A1) action selection. • Energized : <i>non</i> Deenergized: <i>rEB</i> • Factory adjusted as Energized
<i>R2L_A</i>	Alarm 2 (A2) action Energized/Deenergized selection <ul style="list-style-type: none"> • Sets the Alarm 2 (A2) action as Energized or Deenergized. • Not available when rotary switch No.0 is selected in Alarm 2 (A2) action selection or when the option [A2] is not applied. • Energized : <i>non</i> Deenergized: <i>rEB</i> • Factory adjusted as Energized
<i>R1H_Y</i>	Alarm 1 (A1) hysteresis setting <ul style="list-style-type: none"> • Sets hysteresis value for Alarm 1 (A1). • Not available when rotary switch No.0 is selected in Alarm 1 (A1) action selection • Setting range: 0.1 to 100.0°C (°F) • Factory adjusted as 1.0°C
<i>R2H_Y</i>	Alarm 2 (A2) hysteresis setting <ul style="list-style-type: none"> • Sets hysteresis value for Alarm 2 (A2). • Not available when rotary switch No.0 is selected in Alarm 2 (A2) action selection or when the option [A2] is not applied. • The setting range and initial value are the same as those of Alarm 1 (A1) hysteresis setting.
<i>R1D_Y</i>	Alarm 1 (A1) delayed timer setting <ul style="list-style-type: none"> • Sets the action delayed timer for Alarm 1 (A1). Alarm activates when the setting time is passed after the input value enters the alarm output range. • Not available when rotary switch No.0 is selected in Alarm 1 (A1) action selection • Setting range: 0 to 9999 seconds • Factory adjusted as 0 seconds
<i>R2D_Y</i>	Alarm 2 (A2) delayed timer setting <ul style="list-style-type: none"> • Sets the action delayed timer for Alarm 2 (A2). Alarm activates when the setting time is passed after the input value enters the alarm output range. • Not available when rotary switch No.0 is selected in Alarm 2 (A2) action selection or when the option [A2] is not applied. • The setting range and initial value are the same as those of Alarm 1 (A1) delayed timer setting
<i>H_Y</i>	ON/OFF action hysteresis setting <ul style="list-style-type: none"> • Sets the ON/OFF action hysteresis for the control output. • This setting item is available only when the control output is ON/OFF action. • Setting range: 0.1 to 100.0°C (°F) • Factory adjusted as 1.0°C
<i>F_{IL}F</i>	PV filter time constant setting <ul style="list-style-type: none"> • Sets the PV filter time constant value. If the value is set too large, it affects control result due to the delay of response. • Setting range: 0.0 to 10.0 seconds • Factory adjusted as 0.0 seconds

Character	Name, Description, Setting range
4FLH	Scaling high limit value setting <ul style="list-style-type: none"> • Sets the scaling high limit value. • If the scaling high limit value is changed, the main setting high limit value becomes the same value as the scaling high limit value. • Setting range: Scaling low limit value to input range maximum value • Factory adjusted as 1370°C
4FL	Scaling low limit value setting <ul style="list-style-type: none"> • Sets the scaling low limit value. • If the scaling low limit value is changed, the main setting low limit value becomes the same value as the scaling low limit value. • Setting range: Input range minimum value to scaling high limit value • Factory adjusted as -200°C

Main setting high and low limit values and Scaling high and low limit values settings

When setting the main setting high and low limit values, the values should be set within the scaling setting range. (Set the scaling setting range first, then set the main setting high or low limit value.)

However, when the scaling high or low limit value is changed, the main setting high or low limit value becomes the scaling high or low limit value.

[For example]

The initial main setting high limit value: 400°C

The initial main setting low limit value: -200°C

The initial scaling high limit value: 1370°C

The initial scaling low limit value: -200°C

When the scaling high limit value is changed to 1000°C and scaling low limit value to -100°C, the main setting high and low limit values are automatically set to 1000°C and -100°C respectively. (Therefore, it is necessary to set the main setting high and low limit values again.)

Scaling high and low limit values setting affects the proportional band of the control action. By shortening the scaling span, the control resolution can be enhanced.

[For example]

Scaling high limit value: 1370°C
Scaling low limit value: -200°C } Scaling span: 1570°C

Proportional band: 2.5%

Proportional band converted value (°C): 39.25°C

Scaling high limit value: 400°C } Scaling span: 400°C



Scaling low limit value: 0°C

Proportional band: 2.5%



Proportional band converted value (°C): 10°C

When comparing the control resolutions, the control resolution of scaling span 400°C is finer than that of scaling span 1570°C

4.6 Control output OFF function

Character	Name, Descriptions
OFF	Control output OFF function <ul style="list-style-type: none"> • This is the function to switch the control output OFF even if power is supplied to the instrument. "OFF" is indicated on the PV display. The function is used when required to halt the control action or the FCS-13A is not used in multiple controllers. • This function can be selected from any mode or from any setting item by pressing the  key for approx. 1 second. • Once this function is enabled, it cannot be released even if the power to the instrument is turned OFF and ON again. To cancel the function, press the  key again for approx. 1 second.

4.7 Output manipulated variable display

Character	Name, Descriptions
Output manipulated variable	Output manipulated variable display <ul style="list-style-type: none"> • In the PV/SV display mode, press the  key for approx. 3 seconds. The display will be changed to main setting mode during the process, however, keep pressing until the output manipulated variable is displayed. (Manipulated variable is indicated on the SV display blinking the decimal point.) If the  key is pressed again, the mode will revert to the PV/SV display.

Sensor correction function

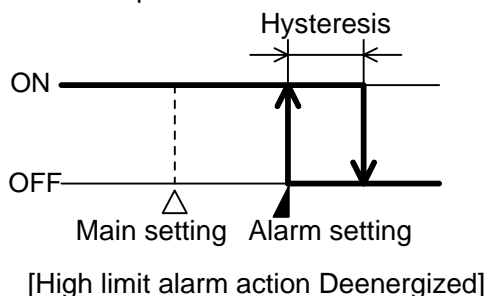
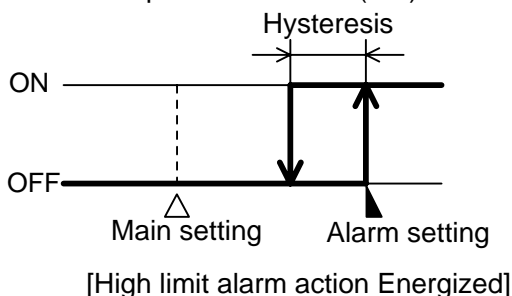
Corrects the input value from the sensor. When a sensor cannot be set at a location where control is desired, the sensor measuring temperature may deviate from the temperature in the controlled location. When controlling with plural controllers, the accuracy of sensors affects the control.

Therefore, sometimes the measuring temperature (input value) does not concur with the same setting value. In such a case, the control can be set with the desired temperature by shifting the input value of sensors.

Energized/Deenergized

When the temperature alarm action energized is selected, the alarm output (between terminals 3-4, or 3-5) is conducted (ON) status while the alarm output indicator is lit. The alarm output is not conducted (OFF) status while the alarm output indicator is not lit.

When the temperature alarm action deenergized is selected, the alarm output (between terminals 3-4, or 3-5) is not conducted (OFF) status while the alarm output indicator is lit. The alarm output is conducted (ON) status while the alarm output indicator is not lit.



5. Running

After the controller has been mounted to the control panel and wiring is completed, it can be started in the following manner.

(1) Turn the power supplied to the FCS-13A ON

For approx. 2 seconds after the power is switched ON, the type of sensor and °C/°F are indicated on the PV display, and the rated scale maximum value on the SV display. Refer to [Table 4.2-1].

(If any other value is set at the Main setting high limit value setting, the SV display indicates the value.) During this time, all outputs and LED indicators are in their OFF status.

After that, the PV display indicates actual temperature and the SV display indicates the main setting value.

While the Control output OFF function is working, "OFF" is indicated on the PV display.

(2) Input the setting value

Referring to Chapter 4. Operation, input each setting value.

(3) Turn the load circuit power ON.

Starts the control action so as to keep the controlled object at the main setting value.

6. Other functions

(1) Input burnout

[Overscale]

When the thermocouple or RTD is burnt out or the input value exceeds the [Rated scale maximum value + 5% of rated scale span], the control output is turned off, and the PV display blinks [- - -].

[Underscale]

If the input value falls below [Rated scale minimum value - 1% of rated scale span], the control output is turned off, and the PV display blinks [- - -].

(2) Self-diagnosis function

The CPU is monitored by a watchdog timer, and when any abnormal status is found on the CPU, the controller is switched to warm-up status.

(3) Automatic cold junction temperature compensation (thermocouple input type)

This detects the temperature at the connection terminal between the thermocouple and the instrument, and always keeps it at the same status as when the reference junction is located at 0°C (32°F).

(4) Warm-up indication

After the power supply to the instrument is turned on, the PV display indicates the characters of the sensor input and temperature unit, and the SV display indicates the rated scale maximum value for approx. 2 seconds.

7. Action explanations

7.1 Standard action

Action	Heating (reverse) action	Cooling (direct) action
Control action		
Relay contact output		
Non-contact voltage output		
Current output		
Indicator (OUT) Green		

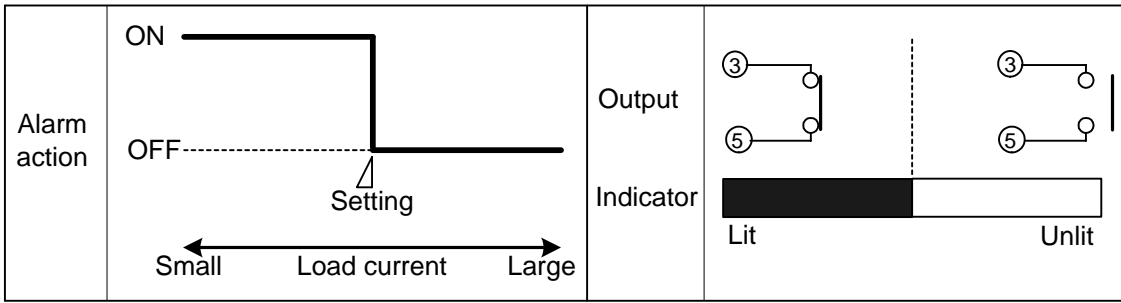
: Alternates between ON and OFF.

7.2 ON/OFF action

Action	Heating (reverse) action	Cooling (direct) action
Control action		
Relay contact output		
Non-contact voltage output		
Current output		
Indicator (OUT) Green		

: Either ON or OFF.

7.3 Heater burnout alarm



7.4 Alarm 1 (A1) and 2 (A2) actions

	High limit alarm action	Low limit alarm action	High/Low limits alarm action
Alarm action			
Output			
Indicator			
	High/Low limit range alarm action	Process high alarm action	Process low alarm action
Alarm action			
Output			
Indicator			
	High limit alarm with standby	Low limit alarm with standby	High/Low limits alarm with standby
Alarm action			
Output			
Indicator			
	High/Low limit range alarm with standby	Process high alarm with standby	Process low alarm with standby
Alarm action			
Output			
Indicator			

part: Acts ON or OFF.

part: The standby functions.

Output terminals for Alarm 2 (A2): 3 and 5

8. Explanation of the control action

8.1 Fuzzy self-tuning

Fuzzy self-tuning is a function to perform a fine adjustment to the PID values automatically.

The stable control can be carried out even if the conditions of the process are changed due to the things like variety and variable production.

- (1) When the control action is rising, the controller performs the control by the PID values tuned in advance.
- (2) When the control result is disordered by disturbance or the process change, the controller checks the converging status, and performs fine adjustment to the PID values if necessary.
 - (a) If the convergence is performed smoothly, the PID values are not changed.
 - (b) If the convergence speed is slow, the controller corrects the PID values to make the convergence faster.
 - (c) When overshoot is generated during the convergence, the controller corrects the PID values so as not to generate overshoot.
 - (d) When hunting is generated, the controller checks the waveform and performs fine adjustment to the PID values.

The instrument is always in self-tuning status itself, and when deviation is created it starts the tuning. Even if in fuzzy self-tuning status, when very large hunting is caused and the control is not stable, it starts auto-tuning automatically.

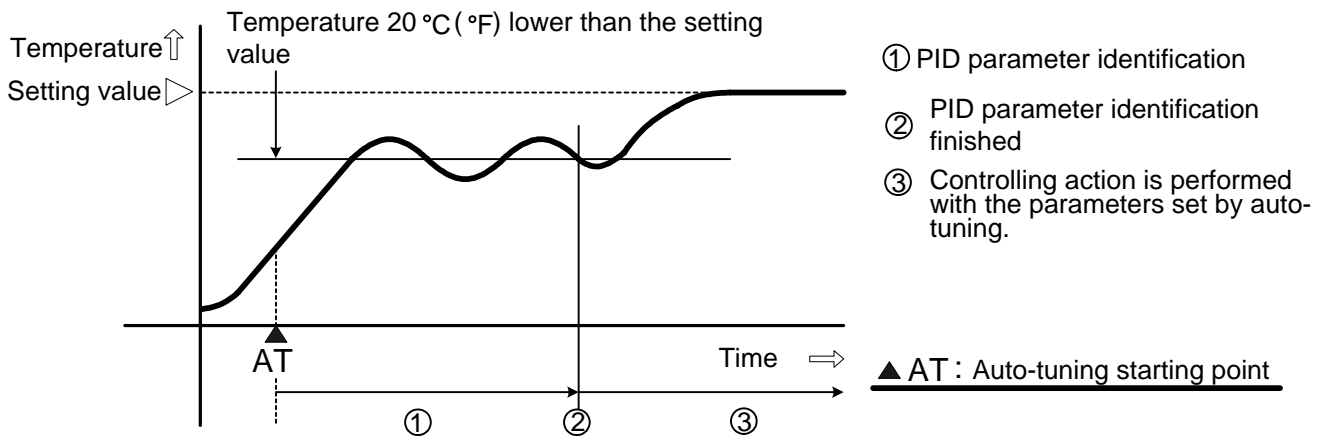
When the auto-tuning performance is designated by key operation, the tuning is initiated and when the control is stabilized, the auto-tuning is released and returns to the self-tuning status.

8.2 PID auto-tuning of the FCS-13A

In order to decide each value of P, I, D and ARW automatically, this system makes the controlled object's temperature fluctuate. One type is automatically selected from the following 3 fluctuation types.

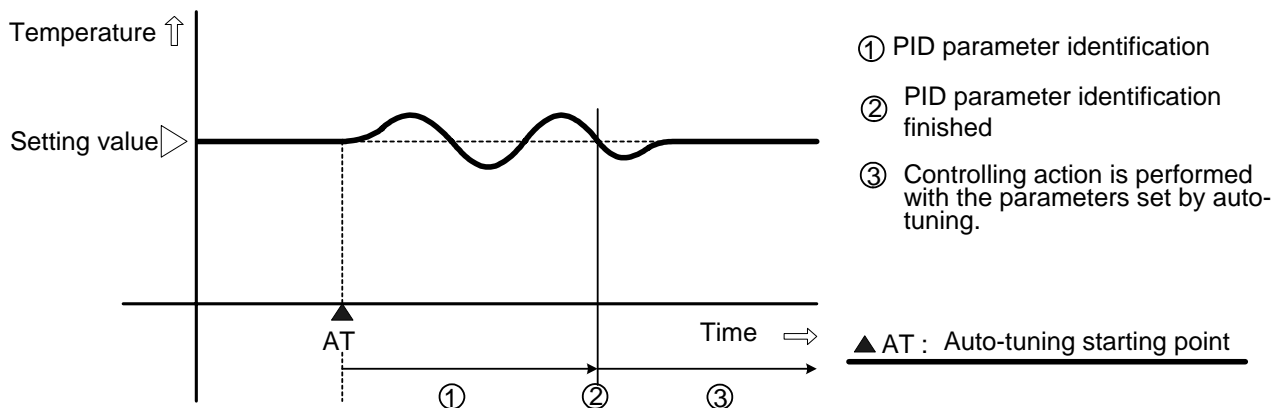
- **When the difference between setting value and processing temperature is large when the temperature rises.**

Fluctuation is applied at the temperature 20°C (°F) lower than the setting value.



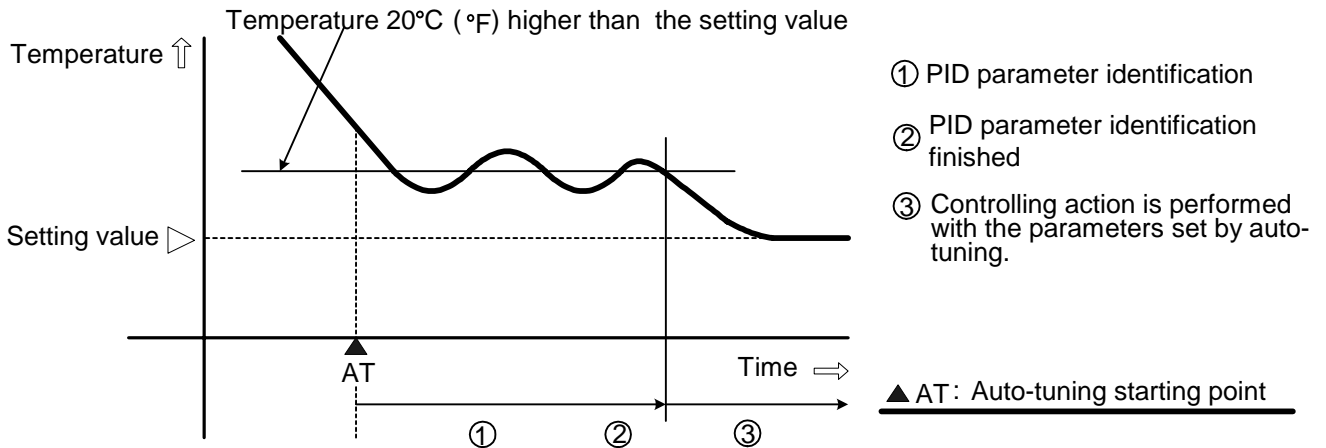
- **When the control is stable**

Fluctuation is applied at the setting value.



- When the difference between setting value and processing temperature is large when the temperature falls.

Fluctuation is applied at the temperature 20°C (°F) higher than the setting value.



9. Mounting to the control panel

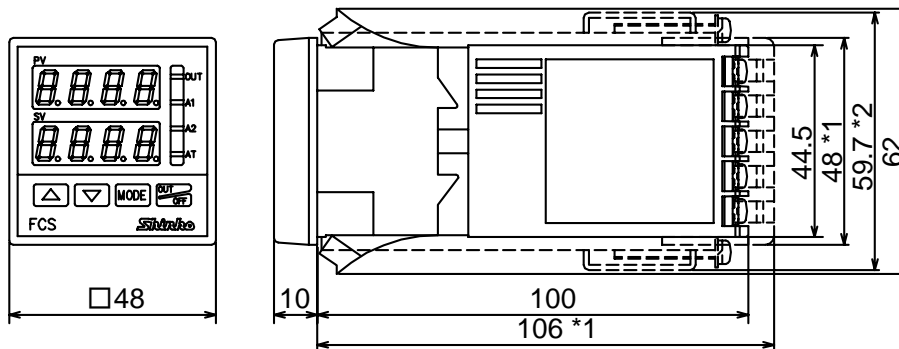
9.1 Site selection

This instrument is intended to be used under the following environmental conditions (IEC61010-1):
Overvoltage category II, Pollution degree 2

Mount the controller in a place with:

- (1) A minimum of dust, and an absence of corrosive gases
- (2) No flammable, explosive gases
- (3) No mechanical vibrations or shocks
- (4) No exposure to direct sunlight, an ambient temperature of 0 to 50°C (32 to 122°F) that does not change suddenly
- (5) An ambient non-condensing humidity of 35 to 85%RH
- (6) The controller away from large capacity electromagnetic switches or cables through which large current is flowing
- (7) No water, oil or chemicals or where the vapors of these substances can come into direct contact with the unit

9.2 External dimension drawing

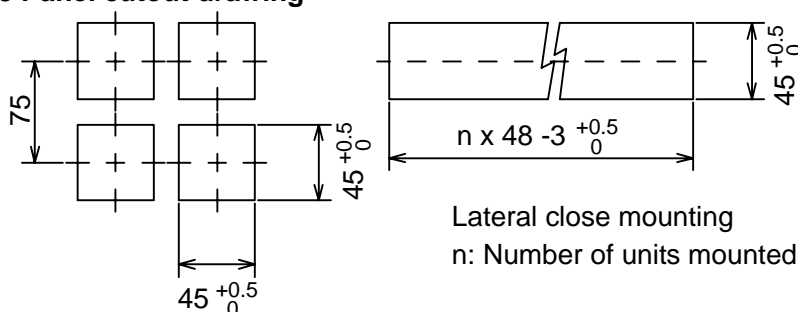


[Fig. 9.2-1]

*1 When the option [TC] is applied

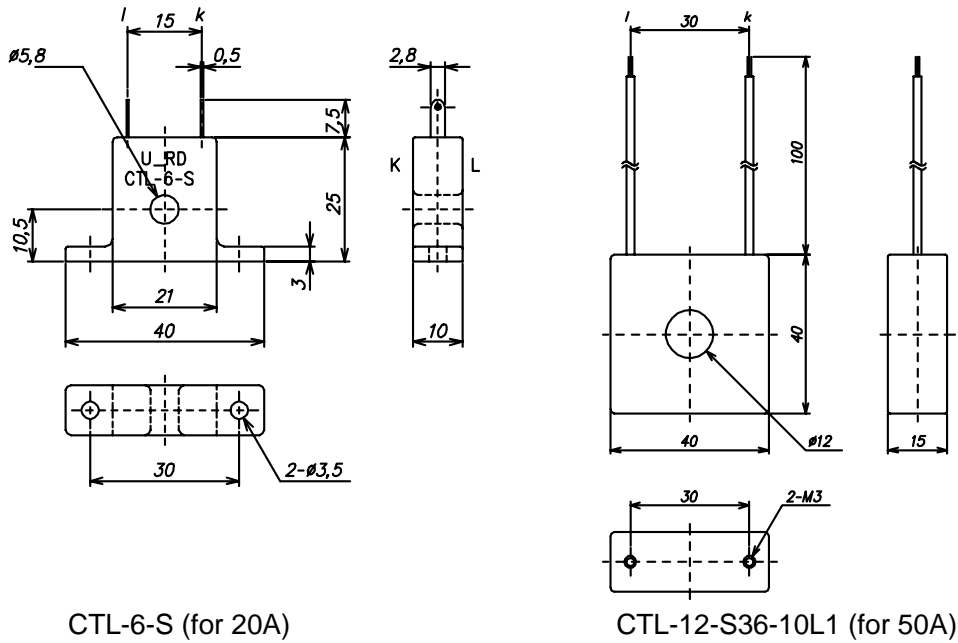
*2 When the option [BL] is applied

9.3 Panel cutout drawing



[Fig. 9.3-1]

9.4 CT (current transformer) dimension drawing



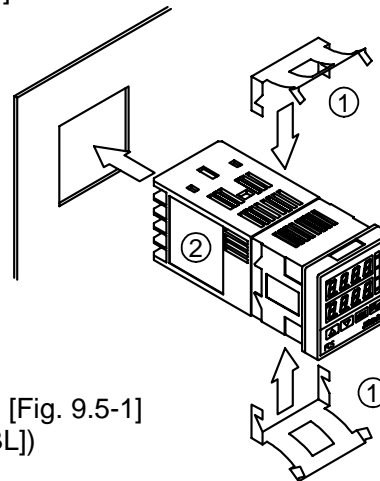
[Fig. 9.4-1]

9.5 Mounting

When the **one-touch type mounting bracket** is used:

Mounting panel thickness is 1 to 3mm.
Catch the mounting bracket ① to the top and bottom of the instrument first.
Then, insert the FCS-13A ② from the front of the mounting panel.

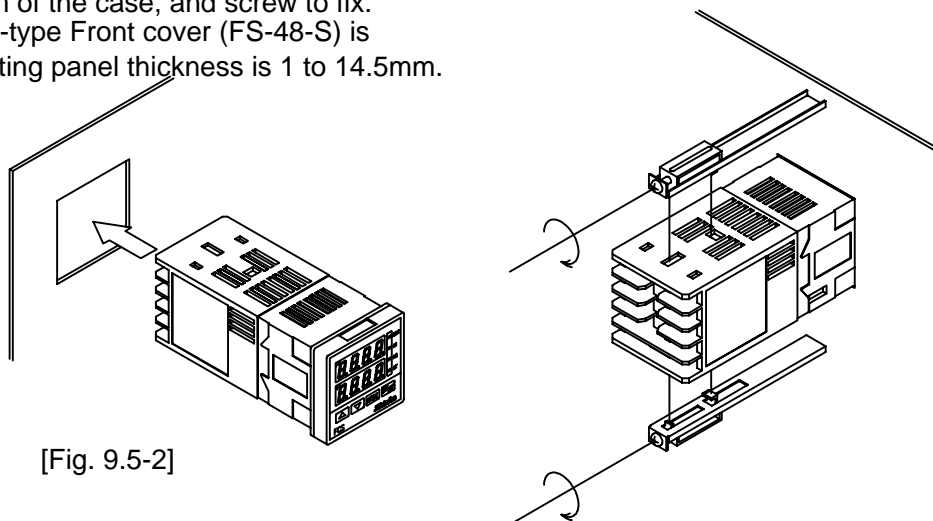
When the Soft-type Front cover (FS-48-S) is applied, mounting panel thickness is 1 to 2.5mm.



[Fig. 9.5-1]

When the **screw type mounting bracket** (option [BL]) is used:

Mounting panel thickness is 1 to 15mm.
Insert the FCS-13A from the front of the panel.
Catch the mounting bracket to the holes top and bottom of the case, and screw to fix.
When the Soft-type Front cover (FS-48-S) is applied, mounting panel thickness is 1 to 14.5mm.



[Fig. 9.5-2]



Notice

As the case is made of resin, do not use excessive force while screwing in the mounting bracket. The torque is approximately 0.12N•m.

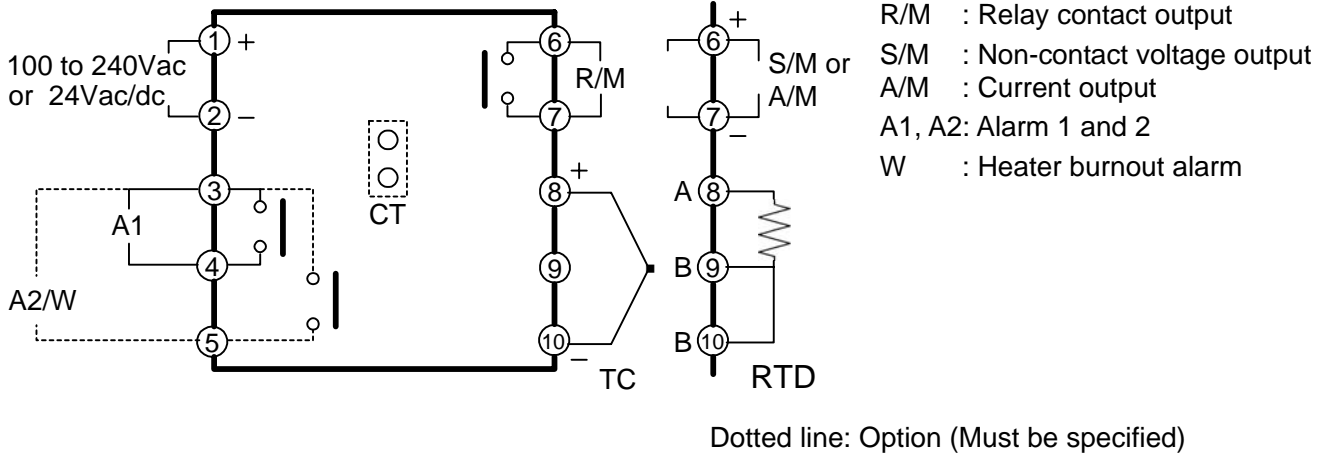
10. Wiring connection



Warning

Turn the power supply to the instrument **OFF** before wiring or checking.
Working or touching the terminal with the power switched **ON** may result in an **Electric Shock** which could cause severe injury or death.

10.1 Terminal arrangement



[Fig. 10.1-1]

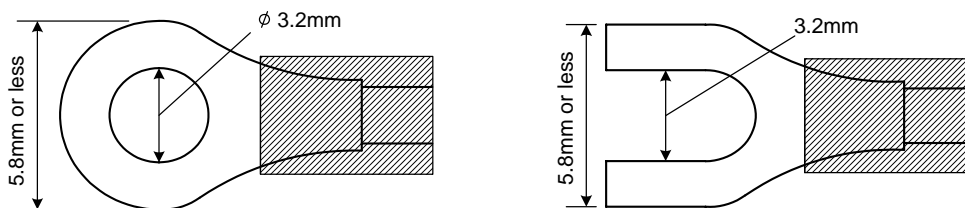


Notice

- The terminal block of the FCS-13A is designed to be wired from the left side. The lead wire must be inserted from the left side of the terminal, and fastened with the terminal screw.
- Use a thermocouple and compensating lead wire according to the input specification of this controller.
- Use a 3-wire system of RTD according to the input specification of this controller.
- This controller has neither built-in power switch nor fuse. Therefore, it is necessary to install them in the circuit near the external controller.
(Recommended fuse: Time-lag fuse, rated voltage 250V, rated current 2A)
- In the case of 24Vdc for power source, do not confuse the polarity.
- With the relay contact output type, externally use an auxiliary electromagnetic switch according to the capacity of the load to protect the built-in relay contact.
- When wiring, keep input wire (thermocouple, RTD, etc.) away from AC source and load wire to avoid external interference.

● Solderless terminal

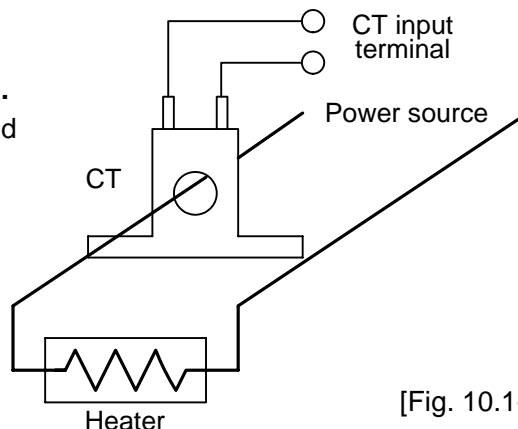
Use a solderless terminal with an insulation sleeve that fits to an M3 screw as shown below.



Solderless terminal	Manufacturer	Model name	Tightening torque
Y type	Nichifu Terminal Industries CO.,LTD.	1.25Y-3	0.6N•m Max. 1.0N•m
	Japan Solderless Terminal MFG CO.,LTD.	VD1.25-B3A	
Round type	Nichifu Terminal Industries CO.,LTD.	1.25-3	
	Japan Solderless Terminal MFG CO.,LTD.	V1.25-3	

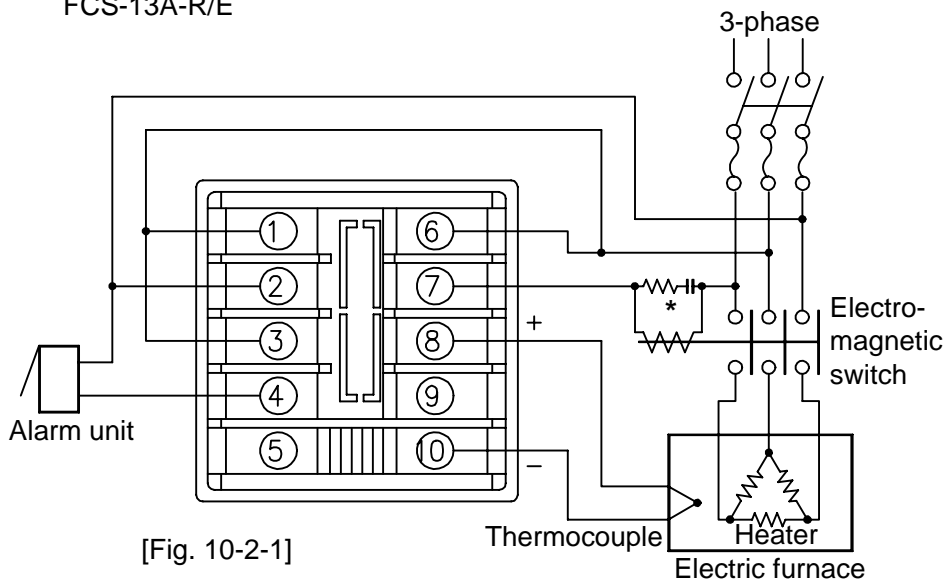
Option: Heater burnout alarm output

- (1) **This alarm is not available for detecting current under phase control.**
- (2) Use the current transformer (CT) provided and pass one lead wire of heater circuit into the hole of the CT.
- (3) When wiring, keep CT wire away from AC source and load wire to avoid external interference.



[Fig. 10.1-2]

10.2 Wiring connection example
FCS-13A-R/E



[Fig. 10-2-1]

* To prevent the unit from harmful effects of unexpected level noise, it is recommended that a surge absorber be installed between the electromagnetic switch coils.

AC or DC is available for supply voltage 24V, however, do not confuse the polarity when DC is applied.

11. Specifications

11.1 Standard specifications

Mounting method : Flush

Setting : Input system by using membrane sheet key

Display

PV display : Red LED display 4 digits, size, 4(W) x 8(H)mm

SV display : Green LED display 4 digits, size, 4(W) x 8(H)mm

Accuracy (Setting and indicating)

Thermocouple : Within $\pm 0.3\%$ of input range full scale ± 1 digit,
 However, for R input 0 to 200°C (0 to 400°F): Within $\pm 6^\circ\text{C}$ (12°F)
 for B input 0 to 300°C (0 to 600°F): The accuracy is not guaranteed.
 for K, J input less than 0°C (32°F): Within $\pm 0.5\%$ of input range full scale ± 1 digit
 (Cold junction temperature compensating accuracy: $\pm 1.5^\circ\text{C}$ at 0 to 50°C)

Input sampling period: 0.125 seconds (0.25 seconds when the option [W] is applied.)

Input

Thermocouple : K, J, R, N, PL-II
 External resistance, 100Ω or less

RTD : Pt100, JPt100 3-wire system
 Allowable input lead wire resistance, 10Ω or less per wire

When input burnout: Overscale

Control output

- Relay contact : 1a
Control capacity, 250Vac 3A (resistive load)
250Vac 1A (inductive load $\cos\phi=0.4$)
Electrical life: 100,000 times
- Non-contact voltage: For SSR drive
12⁺²₀Vdc, Maximum 40mA (short circuit protected)
If Shinko SSR (SA-200 series) is used, 4 units are connectable in parallel.
- Current : 4 to 20mA_{dc}
Load resistance, maximum 550 Ω

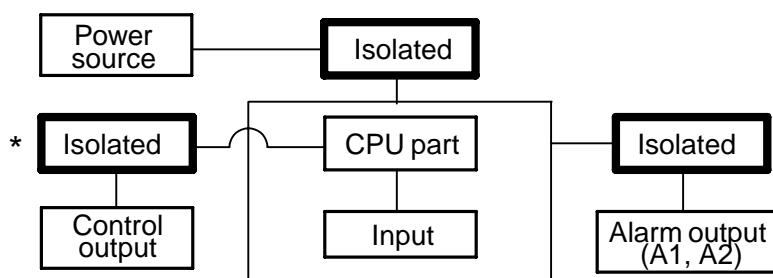
Alarm 1 (A1) output

- Action : ON/OFF action
Hysteresis, 0.1 to 100.0 $^{\circ}$ C ($^{\circ}$ F)
- Output : Relay contact, 1a
Control capacity, 250Vac 3A (resistive load)
250Vac 1A (inductive load $\cos\phi=0.4$)
Electrical life: 100,000 times

Control action

- Fuzzy self-tuning PID action
Proportional band : Automatic
Integral time : Automatic
Derivative time : Automatic
Proportional cycle: 1 to 120s (not available for current output type)
ARW : Automatic
- PID action (with auto-tuning function)
Proportional band : 0.0 to 100.0%
Integral time : 0 to 3600s (off when set to 0)
Derivative time : 0 to 3600s (off when set to 0)
Proportional cycle: 1 to 120s (not available for current output type)
ARW : Automatic
- PD action
Proportional band : 0.0 to 100.0%
Derivative time : 0 to 3600s (off when set to 0)
Proportional cycle: 1 to 120s (not available for current output type)
- ON/OFF action (When P value is set to 0 or 0.0.)
Hysteresis : 0.1 to 99.9 $^{\circ}$ C ($^{\circ}$ F)

Circuit insulation configuration



- * If the control output type is current or non-contact voltage output, between the input and control output is non-isolated.

Insulation resistance

10M Ω or greater at 500Vdc

In the case of the above Circuit insulation configuration (*), the insulation resistance test **must not** be carried out between the input and control output because between them is not isolated.

Dielectric strength

- Between input terminal and ground ----- 1.5kVac for 1 minute
Between input terminal and power terminal ----- 1.5kVac for 1 minute
Between output terminal and ground ----- 1.5kVac for 1 minute
Between output terminal and power terminal ----- 1.5kVac for 1 minute
Between power terminal and ground ----- 1.5kVac for 1 minute

Supply voltage : 100 to 240Vac, 50/60Hz, 24Vac/dc, 50/60Hz

Allowable voltage fluctuation:

- In the case of 100 to 240Vac, 85 to 264Vac
In the case of 24Vac/dc, 20 to 28Vac/dc

Power consumption	: Approx. 8VA
Ambient temperature	: 0 to 50°C (32 to 122°F)
Ambient humidity	: 35 to 85%RH (non-condensing)
Weight	: Approx. 140g
External dimension	: 48 x 48 x 100mm (W x H x D)
Material	: Case, Flame resistant resin
Color	: Case, Light gray
Attached functions	: Control output OFF function, Setting value lock, Setting value limit, Sensor correction, Multi-range, Multi-function, Alarm action delayed timer, Power failure countermeasure, Self-diagnosis, Automatic cold junction temperature compensating function, Burnout, Warm-up indication
Accessories	: One-touch type mounting bracket 1 set Screw type mounting bracket 1 set (When the option [BL] is applied) Instruction manual 1 copy Terminal cover 1 piece (When the option [TC] is applied) Current transformer 1 piece CTL-6-S [When the option W (20A) is applied] CTL-12-S36-10L1 [When the option W (50A) is applied] Wire harness (3m) 1 piece (When the option [W (20A)] or [W (50A)] is applied)

11.2 Optional functions

Alarm 2 (A2) output [Option code: A2]

The alarm action point is set by \pm deviation to the main setting (except Process value alarm).

[When the alarm action is set as Energized]

When the input exceeds the range, the output turns ON or OFF (in the case of High/Low limit range alarm).

[When the alarm action is set as Deenergized]

The output acts conversely.

When this option [A2] and the option [W] are applied together, the output terminal is common.

Setting accuracy: Within $\pm 0.3\%$ of input range full scale ± 1 digit

Action : ON/OFF action, Hysteresis, 0.1 to 100.0°C (°F)

Output : Relay contact, 1a

Control capacity, 250Vac 3A (resistive load)

250Vac 1A (inductive load $\cos\phi=0.4$)

(however, maximum 3A for the common terminal ③ for A1 and A2)

Electrical life: 100,000 times

Heater burnout alarm (including the sensor burnout alarm) [Option code: W]

Watches the heater current with CT (current transformer), and detects the burnout.

When this option [W] and the option [A2] are applied together, the output terminal is common.

This option cannot be applied to the current output type.

Rating : 20A [Option W(20A)], 50A [Option W(50A)], must be specified

Setting range : In the case of 20A, 0.0 to 20.0A (off when set to 0.0)

In the case of 50A, 0.0 to 50.0A (off when set to 0.0)

Setting accuracy: $\pm 5\%$

Action : ON/OFF action

Output : Relay contact, 1a

Control capacity, 250Vac 3A (resistive load)

250Vac 1A (inductive load $\cos\phi=0.4$)

(however, maximum 3A for the common terminal ③ for A1 and A2)

Electrical life: 100,000 times

Screw type mounting bracket [Option code: BL]

Panel thickness : 1 to 15mm

Color black [Option code: BK]

Front panel : Dark gray

Base and case : Black

Dust-proof•Drip-proof [option code: IP]

Dust-proof and Drip-proof specification (IP54)

Effective for only panel surface, case part is excluded.

To protect the controller from water leak between the control panel and controller, take note of the following.

(1) Use the screw type mounting bracket.

(2) The panel cutout dimension should be proper and have no burrs.

(3) The control panel surface to be mounted should be vertical.

Front cover FS-48-R (soft type, sold separately) is recommended to strengthen the Dust-proof and Drip-proof specification.

Terminal cover [Option code: TC]

Electrical shock protecting terminal cover






Designated specifications

Input range : Shipped as designated input range.

Alarm action : Shipped as designated alarm action.

12. Troubleshooting

If any malfunctions occur, refer to the following items after checking the power and the wiring.

Phenomena	Presumed cause and solution
If PV display is indicating [OFF]	<ul style="list-style-type: none"> Control output OFF function is working. → Press the  key for approx. 1 second to release the function.
If [----] is blinking on the PV display	<ul style="list-style-type: none"> Thermocouple or RTD is burnt out. [In the case of Thermocouple] If the input terminal of the instrument is shorted, and if nearby room temperature is indicated, the instrument should be normal and sensor may be burnout. [In the case of RTD] If approx. 100Ω of resistance is connected to the input terminal between A-B of the instrument and between B-B is shorted, and if nearby 0°C (32°F) is indicated, the instrument should be normal and sensor may be burnout. Lead wire of thermocouple or RTD is not securely mounted to the instrument terminal.
If [----] is blinking on the PV display	<ul style="list-style-type: none"> Polarity of thermocouple or compensating lead wire is reversed. Codes (A, B, B) of RTD do not agree with the instrument terminal.
If indication of PV display is abnormal or unstable.	<ul style="list-style-type: none"> Designation of the Sensor input is improper. Temperature unit (°C or °F) is mistaken. Sensor correcting value is unsuitable. → Set the value suitably. Specification of the thermocouple or RTD is improper. AC leaks into the thermocouple or RTD circuit. There may be a piece of equipment producing inductive interference or noise near the controller.
If process variable (temperature) does not rise.	<ul style="list-style-type: none"> Thermocouple or RTD is burnt out. Lead wire of thermocouple or RTD is not securely mounted to the instrument terminal. confirm the connection of the output is securely carried out.
If settings are impossible. If the value does not change by the  ,  keys.	<ul style="list-style-type: none"> Setting value lock (mode 1 or 2) is designated. → Release the lock designation. During PID auto-tuning or auto-reset. → In the case of PID auto-tuning, cancel the tuning if necessary.
If the setting indication does not change in the rated scale range even if the  ,  keys are pressed, and settings are impossible.	<ul style="list-style-type: none"> Main setting high or low limit value in the Auxiliary function setting mode may be set at the point the value does not change. → Set it again while in the Auxiliary function setting mode.

If any unexplained malfunctions occur other than the above mentioned, make inquiries at our agency or the shop where you purchased the unit.

SHINKO TECHNOS CO.,LTD. OVERSEAS DIVISION

Reg. Office : 2-5-1, Senbahigashi, Minoo, Osaka, Japan

URL : <http://www.shinko-technos.co.jp>

Tel : 81-72-727-6100

E-mail : overseas@shinko-technos.co.jp

Fax: 81-72-727-7006